Patent claims

1. An optical measuring system having a measuring machine that is provided at least with a measuring element for determining locations, and at least with a measuring element for determining angles, at least one common reference surface being provided for the location-determining measuring element and the angle-determining measuring element.

2. The optical measuring system as claimed in claim 1, characterized in that the location-determining measuring element has tactile probes.

3. The optical measuring system as claimed in claim 1, characterized in that the angle-determining measuring element has an autocollimation telescope or an interferometer.

4. The optical measuring system as claimed in claim 1, characterized in that the tactile measuring system is provided with a measuring table and a measuring head, which has at least one measuring element, and in that the optical measuring system has a light beam source, a system for beam shaping, a system for imaging, and at least one optical measuring head.

5. The optical measuring system as claimed in claim 1, characterized in that the common reference surface is formed by the surface of the measuring table, by the very components or modules to be measured, or by an additional reference part.

6. The optical measuring system as claimed in claim 4, characterized in that provided in the measuring table in the region of the components to be measured is a measuring bore via which the measuring beams are introduced directly or indirectly via beam deflecting elements.

7. The optical measuring system as claimed in claim 1, characterized in that in the case of an objective as module the latter is formed from at least two frame structures.

8. The optical measuring system as claimed in claim 7, characterized in that a lower frame structure is provided with a reference surface on which an optical subsystem that is provided with at least one reference surface is mounted.

9. The optical measuring system as claimed in claim 8, characterized in that the optical subsystem is designed as a refractive part of the objective.

10. The optical measuring system as claimed in claim 8, characterized in that the at least one reference surface is designed as a centering collar.

11. The optical measuring system as claimed in claim 8, characterized in that the reference surfaces of the subsystem form a reference point that is adjusted relative to a reference point of an upper frame structure.

12. The optical measuring system as claimed in claim 11, characterized in that the reference point in the upper frame structure is formed by the tip of a double mirror.

13. The optical measuring system as claimed in claim 8, characterized in that air bearings are provided for displacing the upper frame structure on the lower frame structure.

14. The optical measuring system as claimed in claim 8, characterized in that fine adjustment elements are provided for displacing the upper frame structure on

the lower frame structure.

15. The optical measuring system as claimed in claim 7, characterized in that interface surfaces of the two frame structures are formed by external surfaces.

16. The optical measuring system as claimed in claim 15, characterized in that the interface surfaces are created by surface lapping/polishing for a high angle accuracy and flatness.

17. The optical measuring system as claimed in claim 11, characterized in that the measuring table is provided with a lifting table by means of which a subsystem flanged onto the upper frame structure can be displaced along the fastening plane of the subsystem on the upper frame structure.

18. The optical measuring system as claimed in claim 17, characterized in that the flanged-on subsystem is designed as a mirror group.

19. The optical measuring system as claimed in claim 17, characterized in that the lifting table is provided with piezoceramic elements for adjusting the lifting table.

20. An objective that is assembled according to claim 1, for producing semiconductor chips in a lithographic imaging process.

21. A projection objective for microlithography, characterized in that it is adjusted with the aid of a system as claimed in claim 1.

22. A projection objective measuring system having a measuring machine that is provided at least with a measuring element for determining locations and at

least with a measuring element for determining angles, at least one common reference surface being provided for the location-determining measuring element and the angle-determining measuring element.

23. A projection objective for imaging an object from a first plane into a second plane, having

a) at least two lens barrels,

b) refractive and reflective optical elements,

c) a basic structure for bearing and holding the optical elements and the at least two lens barrels, and

d) interface elements with the aid of which the lens barrels are connected to the basic structure.

24. The projection objective as claimed in claim 23, characterized in that the basic structure has at least two frame structures.

25. The projection objective as claimed in claim 23, characterized in that each of the lens barrels has an interface element.

26. The projection objective as claimed in claim 25, characterized in that at least one of the lens barrels has a flexible element in addition to the interface element.

27. The projection objective as claimed in claim 26, characterized in that the additional flexible element is designed as a diaphragm, the diaphragm being soft in an axial direction.

28. The projection objective as claimed in claim 25, characterized in that the interface element is designed as a thin-walled, closed, at least approximately tubular element.

29. The projection objective as claimed in claim 28,

characterized in that the interface element is stiff in all degrees of freedom.

30. The projection objective as claimed in claim 23, characterized in that a multiplicity of flexures are provided for bearing the reflective optical elements.

31. The projection objective as claimed in claim 23, characterized in that the basic structure is formed from ceramic.

32. The projection objective as claimed in claim 31, characterized in that the basic structure is formed from a nonmetallic, ceramic material.

33. The projection objective as claimed in claim 32, characterized in that the basic structure is formed from silicon carbide (SiC).

34. The projection objective as claimed in claim 33, characterized in that the basic structure is formed from a reaction-bonded silicon-infiltrated silicon carbide (SiSiC).

35. The projection objective as claimed in claim 33, characterized in that the basic structure is formed from a sintered silicon carbide (SSiC).

36. The projection objective as claimed in claim 24, characterized in that the interface surfaces of the at least two frame structures are formed by external surfaces.

37. The projection objective as claimed in claim 36, characterized in that the interface surfaces are processed by surface lapping, polishing or grinding to create a high angular accuracy and flatness.

38. The projection objective as claimed in claim 23,

characterized in that at least one lens barrel has an approximately horizontal optical axis.

39. The projection objective as claimed in claim 23, characterized in that at least one lens barrel has a vertical optical axis.

40. The projection objective as claimed in claim 38, characterized in that a reflective element is arranged in the region, averted from a beam splitter element, of the lens barrel in an upper frame structure.

41. The projection objective as claimed in claim 40, characterized in that the at least one lens barrel and the reflective element are arranged at an angle δ of up to 15° to a horizontal axis.

42. The projection objective as claimed in claim 24, characterized in that the lower frame structure is provided with a reference surface on which there is mounted an optical subsystem that is provided with at least one reference surface.

43. The projection objective as claimed in claim 42, characterized in that the reference surfaces of the subsystem form a reference point that can be adjusted relative to a reference point of the upper frame structure.

44. The projection objective as claimed in claim 43, characterized in that the reference point in the upper frame structure is formed by the tip of a double mirror.

45. The projection objective as claimed in claim 42, characterized in that the optical subsystem is designed as a refractive subsystem.

46. The projection objective as claimed in claim 42,

characterized in that air bearings are provided for displacing the upper frame structure on the lower frame structure.

47. The projection objective as claimed in claim 42, characterized in that fine adjustment elements are provided for displacing the upper frame structure on the lower frame structure.

48. The projection objective as claimed in claim 47, characterized in that the fine adjustment elements are designed as piezoceramic elements, electrodynamic drive elements or linear motors.

49. A projection objective for imaging an object from a first plane into a second plane, having

a) at least two lens barrels,

b) refractive and reflective optical elements,

c) a basic structure for bearing and holding the optical elements and the at least two lens barrels, the basic structure having at least two frame structures, and

d) interface elements with the aid of which the lens barrels are connected to the basic structure.

50. A projection objective for imaging an object from a first plane into a second plane, having

a) at least two lens barrels,

b) refractive and reflective optical elements,

c) a basic structure for bearing and holding the optical elements and the at least two lens barrels, the basic structure having at least two frame structures, and

d) interface elements with the aid of which the lens barrels are connected to the basic structure, and

e) flexures for bearing the reflective elements in one of at least two frame structures.